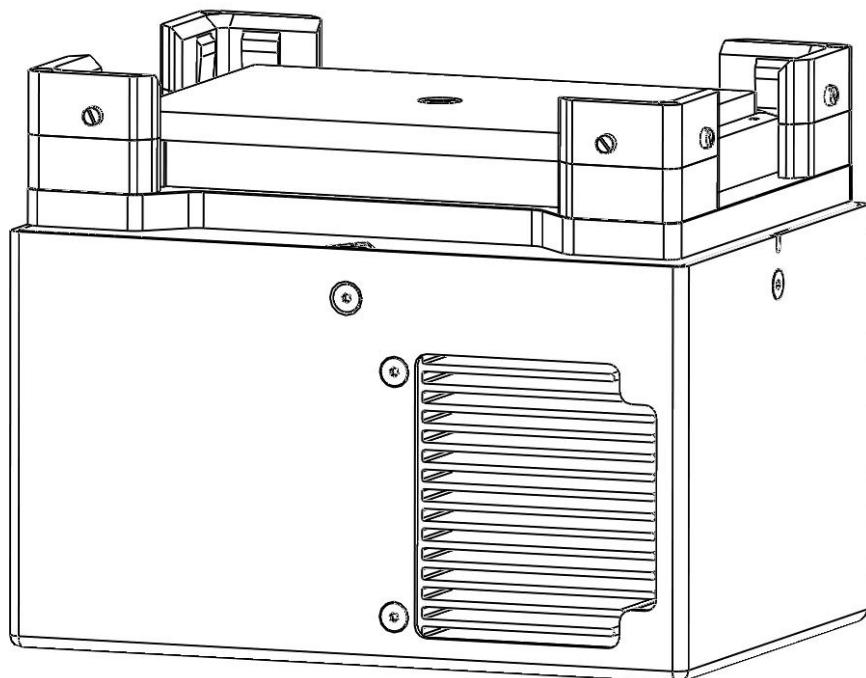


Thermoshake

Part No.: 7100144 / 7100146



User's Manual

Revision level V1.1
August 2012

INHECO Industrial Heating and Cooling GmbH reserves the right to modify their products for quality improvement. Please note that such modifications may not be documented in this manual.

This manual and the information herein have been assembled with due diligence. **INHECO GmbH** does not assume liability for any misprints or cases of damage resulting from misprints in this manual. If there are any uncertainties, please feel free to contact us.

The brand and product names within this manual are registered trade marks and belong to the respective titleholders.

Contact:

inheco GmbH
Fraunhoferstr. 11
D-82152 Martinsried
Germany

Telephone - Sales	089/899593-101
Telephone – Technical Hotline	089/899593-201
Fax	089/899593-499
E-Mail - Sales	sales@inheco.com
E-mail – Technical Hotline	techhotline@inheco.com
Website	www.inheco.com

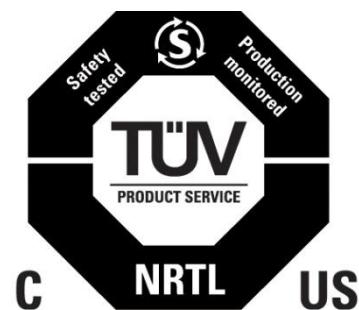
This manual belongs to

Type _____

Serial No. _____

Year of Manufacturing: _____

Order Confirming No. _____



To be filled in by customer:

Inventory No. _____

Place of installation _____

Important Notes

Read this manual carefully before using the Thermoshake.
Liability does not apply for mishandling the unit.

This manual is part of the *Thermoshake* and must be

- retained until the Thermoshake is disposed.
- passed on to the new user when the Thermoshake is sold or lent.

Please contact the manufacturer in case you do not understand something within this manual.

Your opinion about this manual provides us with valuable insights on how we can serve you better. Please do not hesitate to direct your comments to us, using at the address or the phone numbers on page 3.

Please read the safety instructions very carefully. They must be understood and observed in order to ensure safe handling of the unit.

Missing or insufficient knowledge of the manual leads to loss of liability against **INHECO GmbH**. The operator should therefore ask for an instruction confirmation from the manufacturer to ensure.

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1 Explanation of Symbols



A possible danger, leading to serious bodily harm is being pointed out to you.



Caution: hot surface



A possible danger leading to less serious bodily harm is being pointed out to you.
This signal also warns you of tangible damage.



A possible dangerous situation leading to material damage is being pointed out to you.

Important!



This sign refers to useful information as to installation etc.

- Bullet points refer to enumeration.



These arrows indicate instructions.

- The squares refer to procedures running automatically and the results to be achieved.

2 Safety Instructions

Avoid accidents. Always make sure that the unit is disconnected from the power supply system during any installation process.

Electric Shock Hazard



You can suffer an electric shock, if the unit is not connected properly or if you did not disconnect the unit from the power supply system before opening the housing.

Please observe the following measures in order to avoid muscle convulsions, burns, unconsciousness, apnea or even death:



- ⇒ Do not work with open housing when unit is connected to the power supply system.
- ⇒ Always switch off the unit before implementing any alterations.
The unit is operated at a voltage of up to DC 24V.

Burn Hazard



You can burn your skin when touching the inner parts and especially contact surface and disposables. These parts can reach up to 70°C! Do not use materials that are not sufficiently temperature resistant up to 110°C.

Use in Biosafety Laboratory Environment

When using the Thermoshake in a Biosafety Laboratory Environment the user of the Thermoshake is responsible for labeling the device according to the WHO Laboratory Biosafety Manual (ISBN 92 4154650 6). The user is furthermore responsible for operating the Thermoshake depending on the biosafety level regulations according the WHO Laboratory Biosafety Manual.

The safety regulations valid for the lab are to be constantly observed when working with the device.

3 Operation Instructions

The Thermoshake is a state-of-the-art design for SBS listed microplates and deepwell plates including flat bottom and PCR. The temperature controlled Thermoshake is a ready-to-install high performance unit.

Conventional usage

The *Thermoshake* meets the acknowledged rules of technology and complies with today's standards. The manufacturer attached much importance to the user's safety.

The following rules apply to the user:



- Rules of accident prevention
- General rules for technical safety
- EU and other country specific directives

The conventional usage contains the usage according to the manual.

The Thermoshake device is designed for the usage in Life Science and IVD (in vitro diagnostic) environments. The Thermoshake is prepared for an easy integration into IVD applications, but the final IVD validation has to be performed by the first marketer.

The Thermoshake device is intended for Indoor use only.



Who is permitted to operate this unit?

Only instructed and skilled persons are permitted to operate this unit. Only specialized staff is allowed to make any amendments to the operating menu.



Servicing the Thermoshake

Check the filling level of the cooling fluid every 7 weeks.

Every 6000 operating hours or two years what ever occurs first the pump diaphragm and valve has to be changed.

Every 15000 operating hours or three years what ever occurs first the pump has to be changed by an authorized INHECO service technician.
For detailed instructions please see chapter 1

Maintenance and Repair

The Thermoshake must be repaired by authorized INHECO service technicians only. In some cases it might be necessary to send the unit back to INHECO for further evaluation.

INHECO will only accept decontaminated Thermoshake (see chapter Maintenance and Decontamination, returned in the original packing, for repair or maintenance



Shut down and Disposal

The unit is to be disposed in accordance with the environmental directives in effect in the respective country.

Safety instructions in case of contamination have to be preserved.

The Thermoshake is RoHS and WEEE compliant.



Important!

The Thermoshake may only be operated in an upright position. On non-observance the unit will eventually overheat, causing the temperature fuse to blow.

- We strongly recommend mounting the Thermoshake unit to the surface it stands on with the mounting threads built in for this purpose. Additionally, the Thermoshake unit can be positioned with adjusting pins. A drilling template can be found in chapter 7 Technical Specifications.
- The Thermoshake unit must not be stored below -10°C.



Technical Alterations



Important!

- Do not alter the product. For safety reasons no technical changes to this unit are allowed by unauthorized persons. Any modification or change, which is not approved off by the manufacturer leads to loss of guaranty.
- The original parts are especially designed for the Thermoshake. Parts provided by other suppliers are not tested and therefore not approved by Inheco GmbH. Using such parts can impair the functionality of the unit.
- For damages which may occur due to the usage of non original parts, liability is excluded by Inheco GmbH.

Malfunctions



- ⇒ Report occurring malfunctions immediately to the responsible person named on page 3 of this manual.
- ⇒ Ensure that the unit is secured against violation and misuse.
- ⇒ Before the initial operation, dismantled safety relevant parts have to be mounted and checked.
- ⇒ In case of a malfunction, switch off and disconnect the Thermoshake immediately from the power supply. Make sure, that the malfunctioning Thermoshake is not reinstalled again.

Name Plates and Labels



- ⇒ Please check all name plates and labels and ensure that their legibility is maintained at all times during the life cycle of this unit.
- ⇒ Replace all name plates and labels if their legibility is no longer ensured. New labels can be ordered by INHECO.

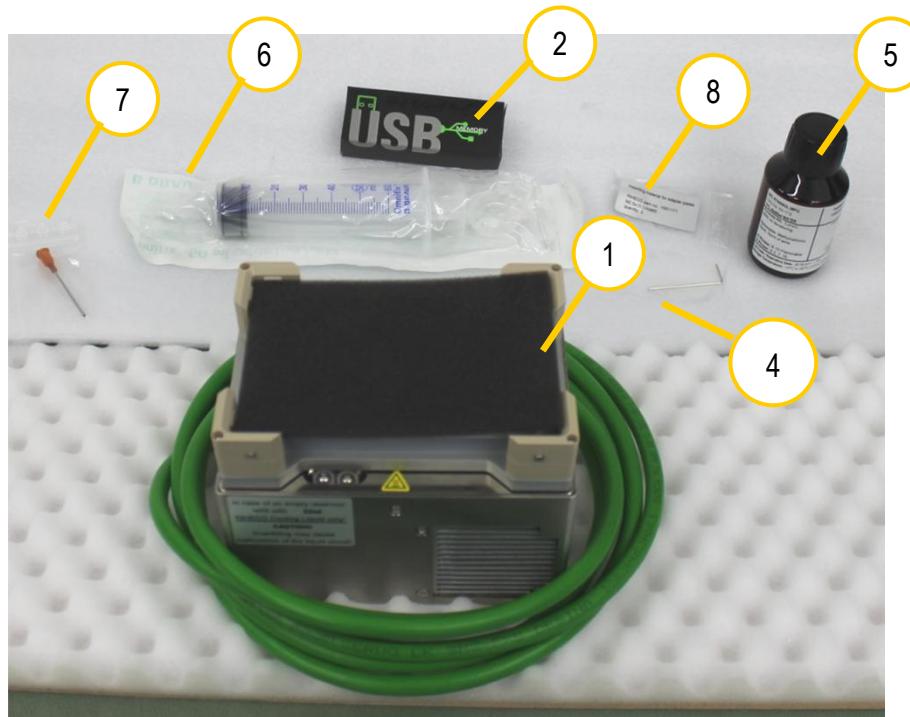
4 Operating the Thermoshake

4.1 Scope of Supply



Before initial operation, make sure that the shipment of your unit is complete and nothing is damaged. Missing parts or damages must be reported to INHECO immediately. The following components are included in each shipment (part numbers in front):

1. 7100146, Thermoshake
2. 900113, manual (stored on USB stick)
3. 900042, USB stick
4. 1014024, socket wrench for filling nozzle of the cooling liquid reservoir
5. 3800053, cooling fluid
6. 1004468, syringe to refill the cooling liquid
7. 1004469, syringe needle to refill the cooling fluid
8. 1001171, 3 cross slot screws to fix thermal adapters



Picture 1: Scope of supply



Important!

The original cooling fluid and spare parts provided by INHECO need to be used in order to guarantee safe and proper function of the Thermoshake.

4.2 Additional Options

Controller: Multi Tec Control (MTC) and Single Tec Control (STC)



4.3 Adapter Plates:

Round Bottom Plate #3200245



- Adapter plate for tempering of microplates with round bottom

Tube Rack 24x1.5ml #7900031



- Adapter plate for 1,5ml tubes

96 Pos. PCR Plate #3201085



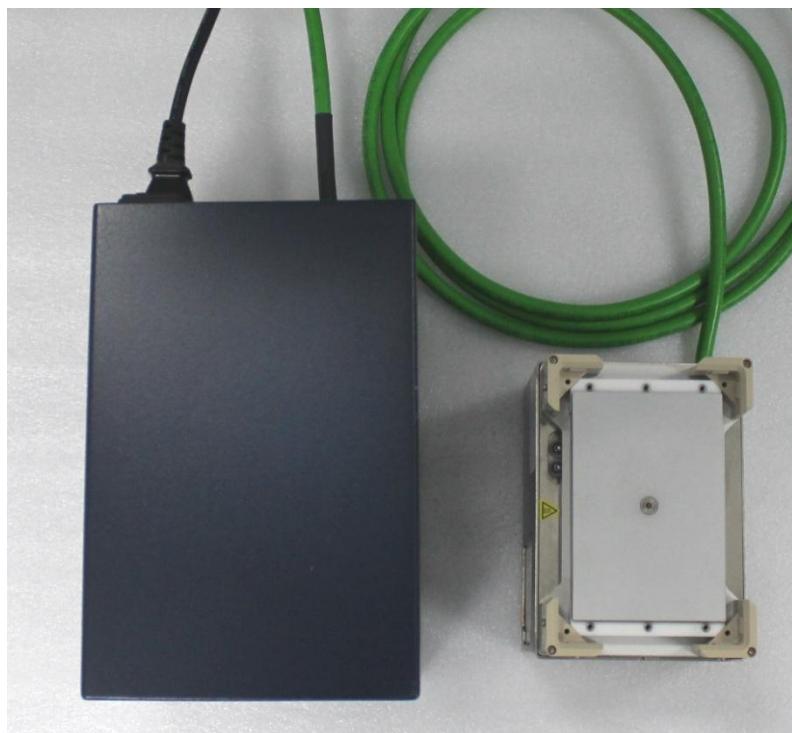
- Adapter for the tempering of 96-Pos. PCR-Plates

384 Pos. PCR Plate #3202086



- Adapter for the Tempering of 384-Pos. PCR-Plates

4.4 Initial Operation



Picture 2: Connecting Thermoshake with MTC / STC (MTC or STC is not part of the shipment)

→ The Thermoshake is only intended for indoor use and has to be placed at a dry, dust free place in an upright position. The standing ground must be even, solid and stable to bear the Thermoshake weight.

→ Check whether the main power switch at the rear panel of the MTC / STC is in the “0” (=off) position.

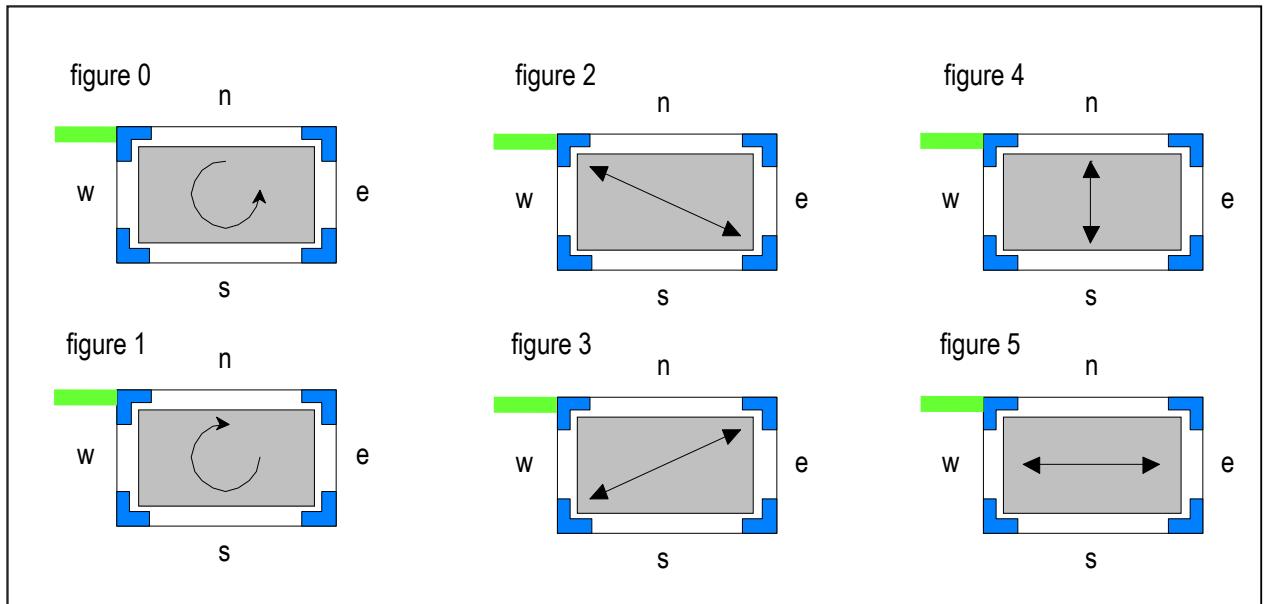
→ Connect the MTC / STC and the Thermoshake with the connecting cable

→ Switch on the MTC / STC by changing the main power switch to the “I” (=on) position.

- The MTC / STC operates immediately after main power switch is in “I” position.
- The current temperature of the Thermoshake is shown on the MTC / STC-Display.
- The actual set temperature of the Thermoshake is shown on the MTC / STC-Display.



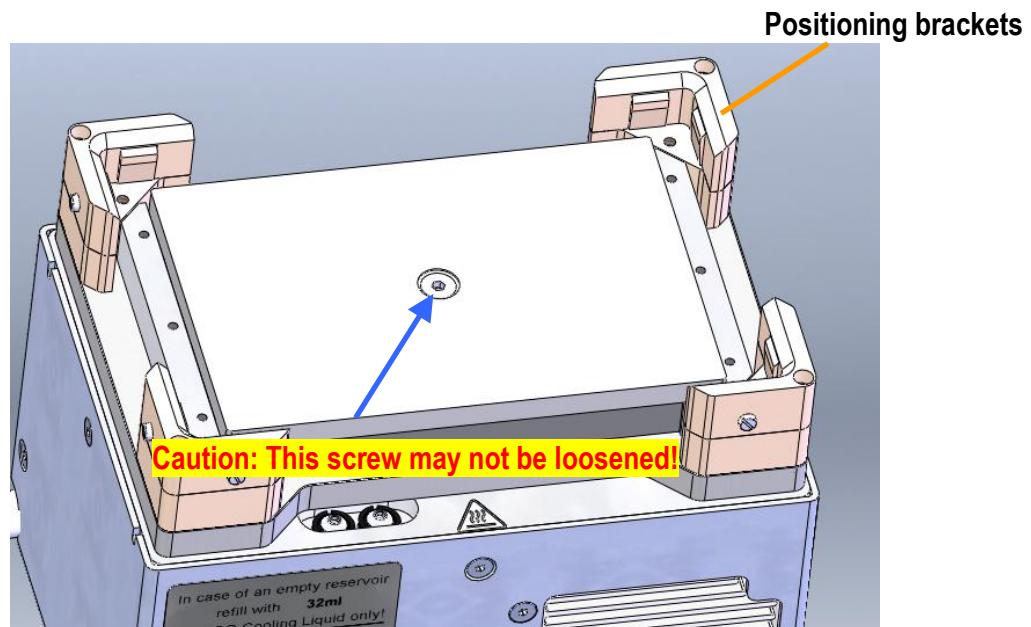
For programming the shaking shape please use the command "SSSFigure" (please see the Firmware Command Set of the MTC or STC).



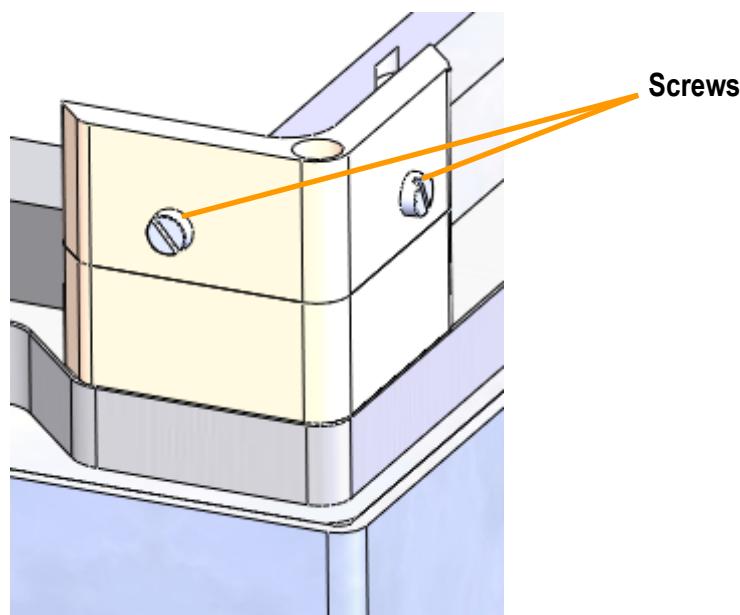
Picture 3: Figure for movement shape

4.5 Fixation of the lab ware

A proper fixation of the lab ware is absolutely essential, to avoid uncontrolled motions of the plate, and to achieve the maximum shaker frequency. The fixing of the lab ware can be adjusted by the eight grub screws in the blue positioning brackets.



Picture 4: Contact plate with positioning brackets

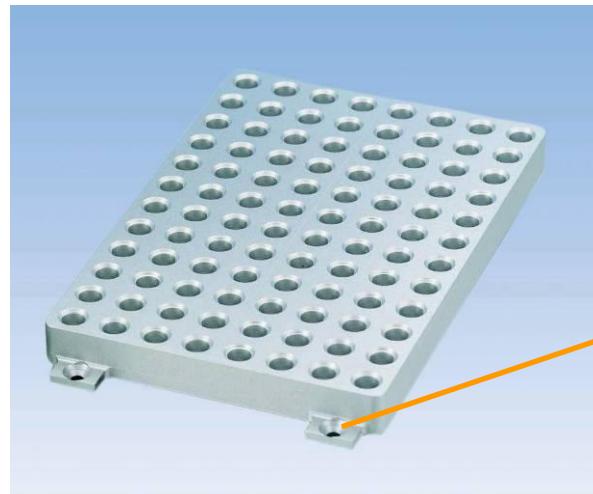


Picture 5: Positioning brackets and grub screws to fix the flat bottom micro plate

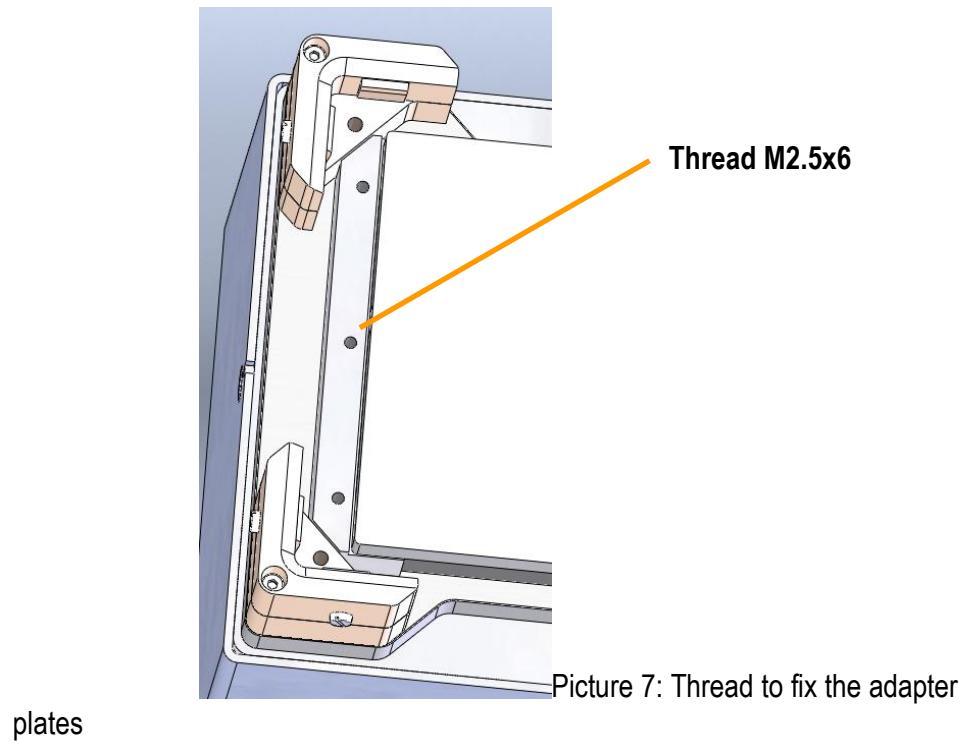
SBS listed plates:
the maximum torque allowed is 0.3 Nm!

4.6 Usage of PCR plates

For special plate formats (96 PCR, 384 PCR, etc.) standard adapters are available at INHECO. The adapter is fixed by the three countersunk screws to the contact plate. The maximum torque allowed to fix the adapter is 0.3 Nm.



Picture 6: 96 pos. PCR adapter plate



Picture 7: Thread to fix the adapter

4.7 Usage of other plates

For special adapter plates please contact INHECO for further information.

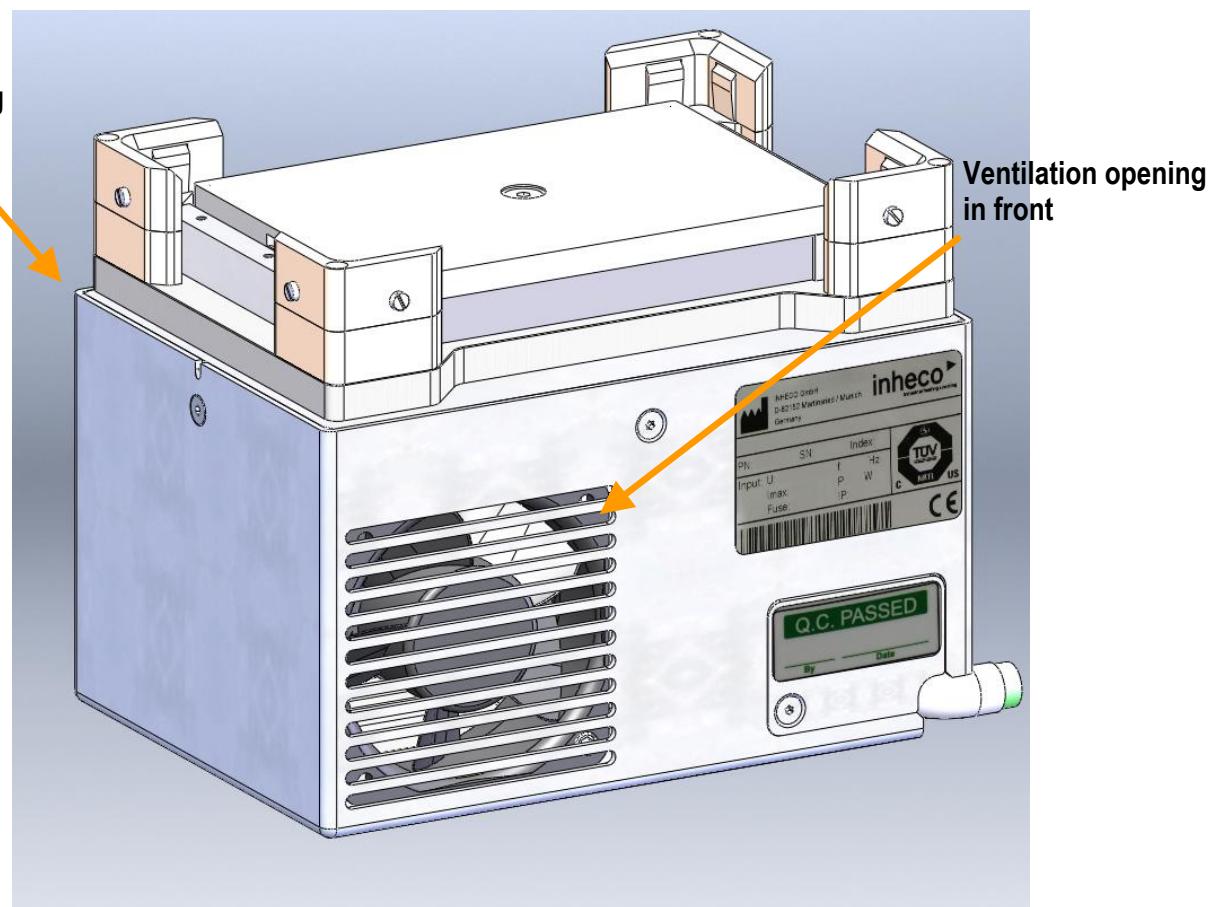
4.8 Safety Instructions for Operation

Thermoshake



Important!

Free air supply must be ensured to avoid injuries to persons and/or damage to the unit. Do not exceed the maximum ambient temperature to prevent the Thermoshake from damage. Ensure that there is a minimum of at least 30mm/1,2 inches free spaces at the ventilation openings to the next wall.



Picture 8: Clear ventilation openings



Only instructed persons are permitted to open the housing. Always disconnect the unit from the power supply system before opening the housing to avoid injuries by electric shock.

Integration of more than one Thermoshake on the working table

Please contact INHECO for further information how to place the units onto the working table to prevent damage from the unit or/and to assure that the Thermoshakes are working within the given specifications.

5 MTC / STC Adjustment

For the precise procedure please refer to the MTC / STC manual.



The PID Parameters of the MTC / STC are preset for a basic Thermoshake configuration. Depending on the use of the Thermoshake with different disposable types (PCR Plates, Microplate, Deepwell Plates, Tubes, etc.) and corresponding adapters the PID parameters and offset values might be adjusted to achieve an optimized thermal behavior. Information about the adjustment of the PID-parameters can be found in the *MTC / STC* manual. If you need any assistance, please contact us.

6 Maintenance

6.1 Refill The Reservoir



The cooling fluid reservoir should be refilled or checked monthly, unless the software of your workstation informs you when a refill is required (ask your workstation provider). With the MTC/STC touch screen display of the controller box it is possible to check if a refill is required or not. INHECO's MTC / STC Demo Tool also indicates when a refill is needed. See instructions to check the filling level further down.

Refill Amounts:

- In case your workstation software informs you of a low filling level, refill 32ml.
- In case the MTC / STC Demo Tool indicates a low filling level, refill 32ml.
- In case the MTC / STC touch screen indicates a low filling level, refill 32ml.
- In case you do not know the filling level and wish to refill as precautionary measure: fill the reservoir with the syringe delivered with the Thermoshake until the liquid is visible in the filling nozzle. Afterwards insert the needle of the syringe (syringe should be empty) as deeply as possible into the filling nozzle and extract as much of the fluid as possible. This method ensures that the reservoir contains cooling fluid at the maximum filling level.

Cooling Liquid & Syringe:

Use the original INHECO cooling fluid or a mixture of 23% ethanol and 77% distilled water to avoid damage to the unit.

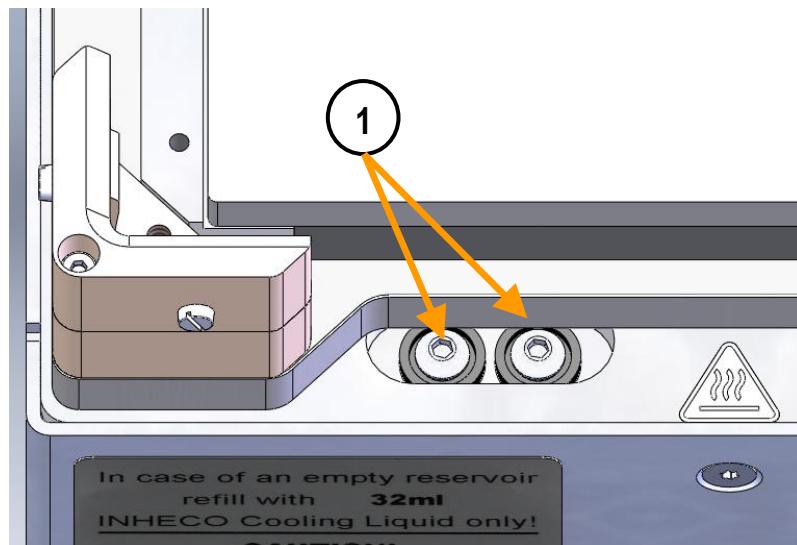
Delivered with Thermoshake:



- 100ml cooling liquid (23% ethanol, 77% distilled water)
- syringe to fill the reservoir
- socket wrench (2mm) to open filling nozzle

Refill Procedure:

- ⇒ Switch off the power of the MTC / STC
- ⇒ Unplug the Thermoshake from the MTC / STC
- ⇒ Loose the screw plugs (1) of the cooling fluid reservoir (see Pic. 10)
- ⇒ Fill the reservoir with the injection syringe delivered with the Thermoshake
- ⇒ The amount of required liquid depends, see instructions further down
- ⇒ Close the reservoir with the screw plug (1) of the cooling fluid reservoir
- ⇒ Connect the Thermoshake with the MTC / STC
- ⇒ The Thermoshake is now ready again for use



Picture 9: the screw plugs of the cooling fluid reservoir

Indications of a refill requirement

In case the software of your workstation does not inform you of a refill requirement, you can either check the filling level via the MTC / STC touch screen display, or via the [MTC / STC Demo Tool](#).

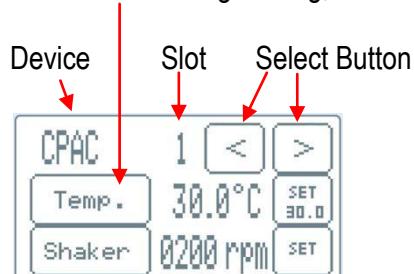
Cooling liquid check with MTC / STC touch screen display:

MTC touch screen:

Error 7 displayed on the MTC touch screen indicates the refill requirement. The touch screen of the MTC controller box displays Error 7 only under the following conditions:

Error 7 is displayed only within the first 10 minutes after the power of the MTC was switched on. To check the filling level, switch the MTC power off and then switch it on again. Also, Error 7 is displayed only if the Thermoshake is selected via the select buttons of the touch screen and if the temperature is activated by touching the button Temp.

To activate heating/cooling, touch the button Temp.



MTC touch screen with select buttons.

Upper left corner should indicate Thermo

- Switch MTC power off
- Switch MTC power on

- Select Thermoshake and Slot via Select Button
- Touch button Temp.

If the touch screen displays Error 7, the liquid reservoir of the selected Thermoshake is below minimum filling level and requires a refill of 32ml cooling fluid. If the touch screen does not display Error 7 after selection of the Thermoshake and Slot, the filling level may not be at maximum level, but the level is sufficient.

STC touch screen:

Error 7 displayed on the STC touch screen indicates the refill requirement. The touch screen of the STC controller box displays Error 7 only under the following conditions:

Error 7 is displayed **only within the first 10 minutes after the power of the MTC was switched on**. To check the filling level, switch the STC power off and then switch it on again. Also, Error 7 is displayed only if the temperature is activated by touching the button Temp.

Error 7 is displayed only if the Thermoshake is selected via the select buttons of the touch screen and if the temperature is activated by touching the button Temp.

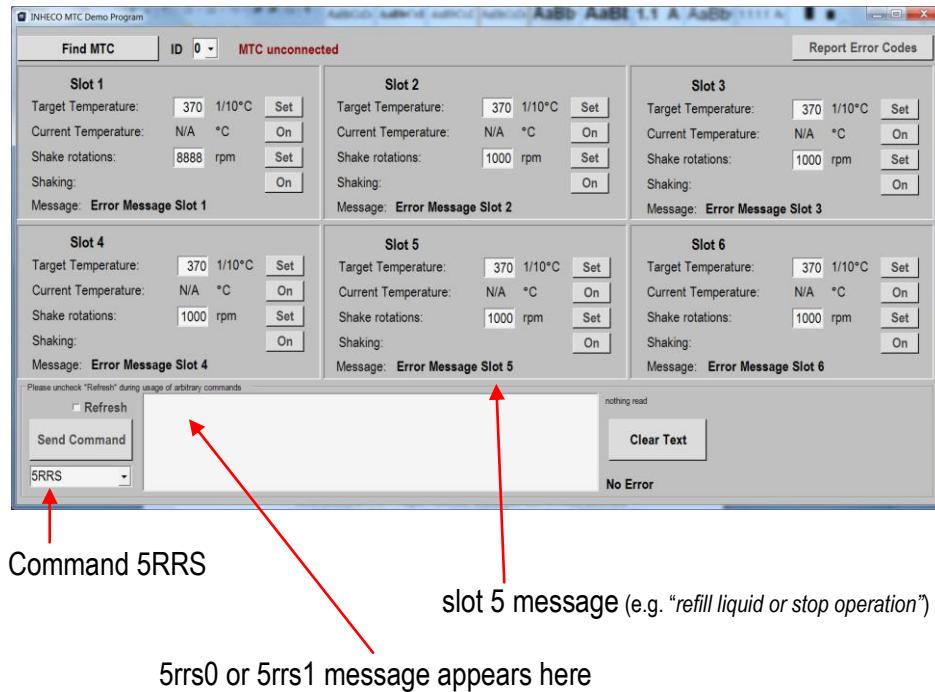
- Switch MTC power off
- Switch MTC power on
- Touch button Temp.

If the touch screen displays Error 7, the liquid reservoir of the Thermoshake is below minimum filling level and requires a refill of 32ml cooling fluid. If the touch screen does not display Error 7, the filling level may not be at maximum level, but the level is sufficient.

Cooling liquid check with INHECO's MTC/STC Demo Tool via USB port:

The MTC/STC Demo Tool and the Demo Tool Manual are delivered on a USB stick with each MTC/STC. With a login and password these files can also be downloaded from www.inheco.com. Login/password can be requested at sales@inheco.com.

MTC/STC Demo Tool interface



In order to check the filling level via the Demo Tool and the RRS command, it is required to activate the temperature of the Thermoshake first. The temperature is activated by a mouse click on the Set button of the target temperature. The value of the target temperature must be between +4°C and +70°C. Enter a value between 40 and 700, then click on Set.

Example of a refill requirement of a Thermoshake at slot 5:

In case your Thermoshake is connected to slot 5, set the target temperature of this Thermoshake and read the slot 5 message (see screenshot further up). In case your slot 5 message reads now: "refill liquid or stop operation now", refill the reservoir of the Thermoshake connected to slot 5 with 32ml cooling liquid.

Cooling liquid check with RRS command:

The REFRESH checkbox must not be selected. Do not set a check in this checkbox (see screenshot further up).

Send command RRS -> Report Reservoir Status (for details of this and other commands see also the firmware command set of the MTC / STC).

Example of an RRS command (see screenshot further up):

In case your Thermoshake is connected to slot 5, send command 5RRS (in capital letters) and the response will be either 5rrsR0 or 5rrs01. The first digit, in this case number 5, stands for the number of the slot you wish to check. The command must be in capital letters, but the response appears in lower case letters. Enter 5RRS into the command field and click on the SEND COMMAND button. The response will be displayed in the response field next to the SEND COMMAND button.

5rrsR0 means that the Thermoshake at slot 5 requires a refill of 32ml because the filling level is less than a third of the maximum level.

5rrs01 means that a refill is not required for this Thermoshake because the filling level is higher than a third of the maximum level.

In case the MTC/STC Demo Tool indicates a reservoir below minimum level, e.g. via response rrsR0 or the message “refill liquid or stop operation now”: Refill 32ml cooling liquid with the syringe (see instructions further up).

For any queries contact our technical support at techhotline@inheco.com

6.2 Maintenance of the pump



Every 6000 operating hours or two years whatever occurs first the pump diaphragm and valve should be changed. This job has to be done by authorized service stuff only or at the INHECO service center / Munich – Germany.

6.3 Cleaning



Important!

Before cleaning the Thermoshake, disconnect the power and make sure that the temperature at the contact surface is below +50°C.

The cleaning of Thermoshake can include a wipe-down of the surface with a moistened cloth. A solution of 70% alcohol can also be used where effective for target organisms.

Make sure, that no moisture enters inner parts! During cleaning the Thermoshake must be disconnected from the MTC / STC / STC outlet!

Do not use aggressive solutions such as acetone, or abrasive cleaners.

Any other cleaning method different to the methods recommended by Inheco, should be checked with INHECO, whether it could damage the equipment.

6.4 Decontamination

The most common decontamination method is by fumigation with formaldehyde or ethylene oxide gas.

The surface decontamination can include a wipe-down of the housing surface. A solution of 70% alcohol should be used where effective for target organisms. It is recommended that the Thermoshake is left running during decontamination and is running for at least 5 minutes in order to purge the atmosphere inside before it is switched off.

Make sure, that no moisture enters inner parts!

6.5 Calibration

For proper thermal performance of the MTC / STC Unit and the connected devices, it is recommended to check the calibration once a year. Depending on the application, shorter calibration intervals may be required. This job has to be done by authorized service stuff only or at the INHECO service center Munich – Germany.

6.6 Spare Parts

Spare Parts for the device must be ordered by INHECO. Only original parts from INHECO may be used.

7 Technical Specifications

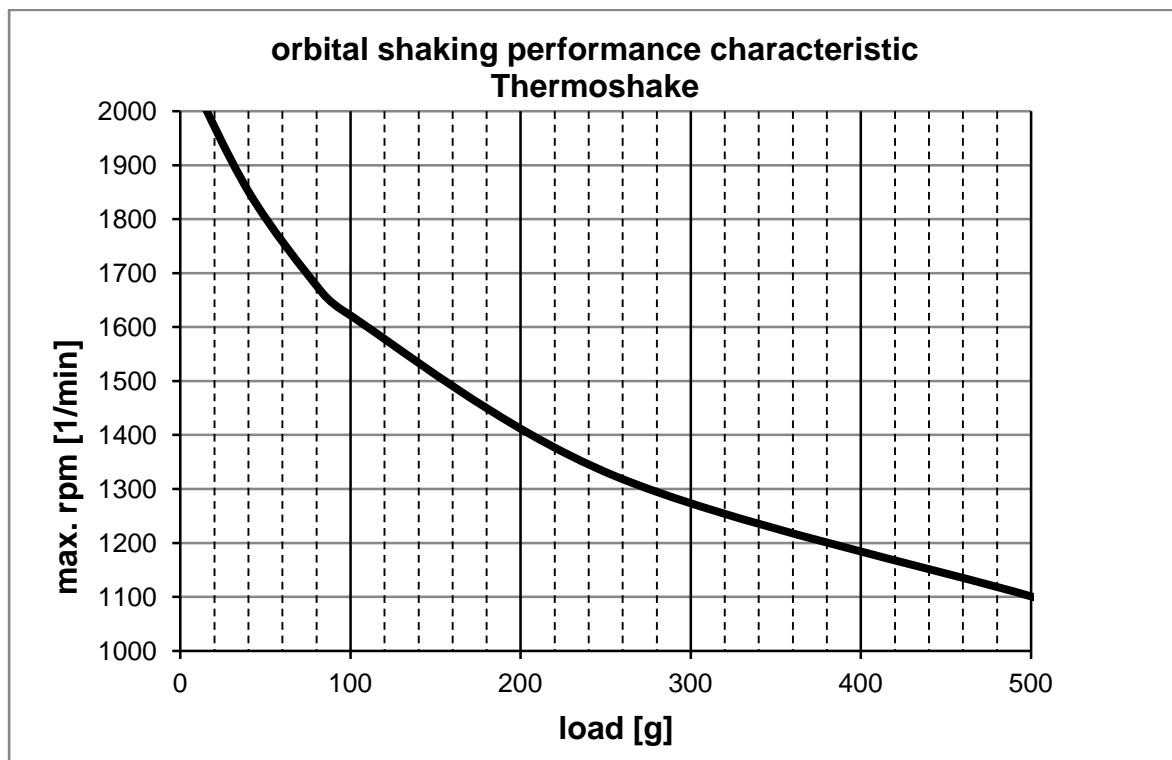
7.1 Technical Data

Table 1: Technical Data Thermoshake

Thermoshake	Technical Data	
Limits for ambient operating temperature	+15°C to +32°C [+59°F to 90°F]	
Input voltage / max. current	24Vdc / 5.3Adc	
Temperature range	+4°C to +70°C [+39.2°F to +158°F]	
Maximum ΔT ($=T_{\text{ambient}} - T_{\text{target}}$)	25°C (cooling mode only) [77°F]	
Tolerable relative humidity	Max. 75%, not condensing*	
Acoustic Noise	Max. 42dBA	
Maximum load of the shaker platform	1.0 kg (see also performance curve)	
Shaker frequency	100 to 2000 rpm	
Masses above 20g reduce the max. speed	(see also performance curve)	
Shaking amplitude	2 mm [0.07874 in]	
Shaking direction	Orbital, diagonal or linear	
O-position accuracy	± 0.1 mm [± 0.00392 in]	
Transportation and storage conditions	-10°C to +60°C, not condensing [+14.0°F to +140°F]	
Outer dimensions height	p/n 7100146 118 mm [4.685 in]	p/n 7100144 116 mm [4.567]
length x width	147 mm x 104 mm [5.787 in x 4.095 in]	
Protection Category	IP 22	
Weight including cables	3.5 kg [7.1 lbs]	

* Condensing can prevent the Thermoshake to achieve the specifications.

7.2 Performance curve



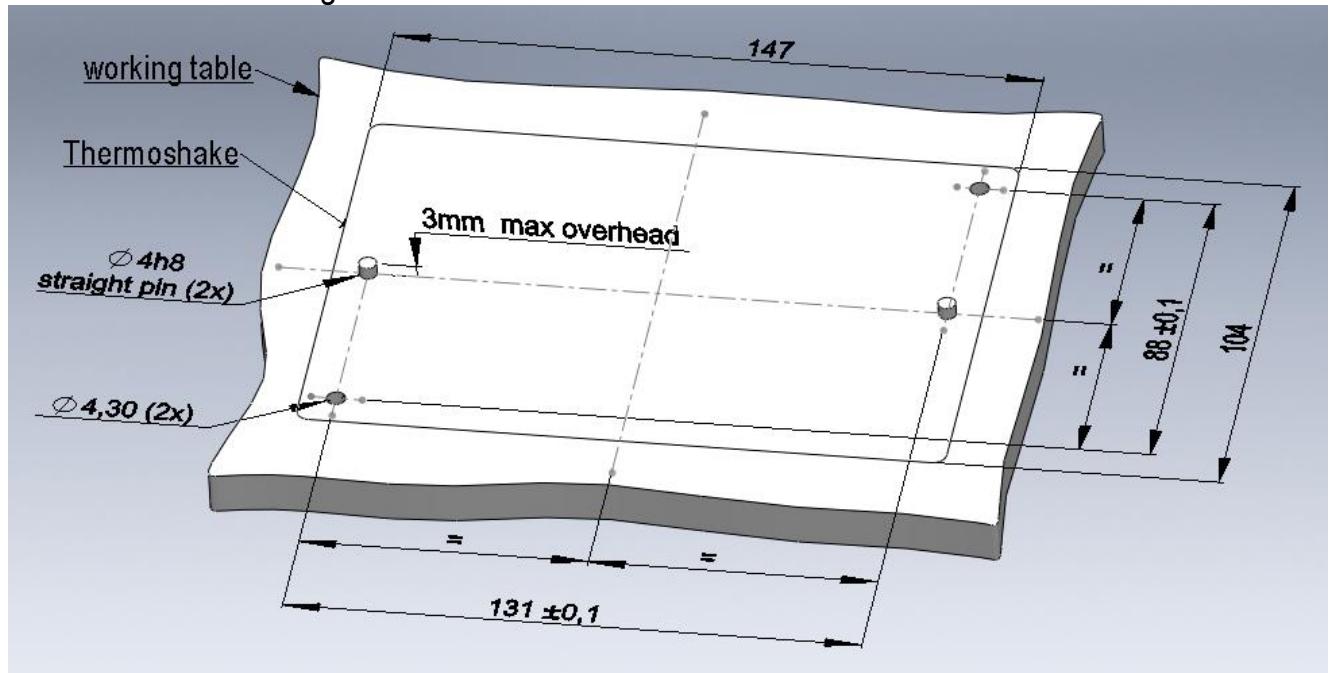
Picture 10: Performance characteristic for the orbital shaking mode

Table 2: Movement shape and max. shaking frequency

Movement shape	Max. shaking frequency with microplate 96 (or load of 82g)
n,w,s,e	1700 rpm
n,e,s,w	1700 rpm
nw, se	700 rpm
ne, sw	700 rpm
n,s,	650 rpm
e, w	400 rpm

7.3 Drilling schematic

Drilling schematic for secure mounting of the Thermoshake unit on a working table



Picture 11: Drilling schematic Thermoshake

We recommend using straight pins for correct positioning of the Thermoshake Unit.

8 Declaration of Conformity

EC - Declaration of Conformity

in accordance with Directive 2006/95/EC, 93/68ECC and 2004/108/EC

Product: Multi and Single TEC Control connected with
CPAC Microplate, CPAC Ultraflate, Thermoshake or Teleshake

Part No: 8900030, 8900031,
7000163, 7000179, 7000195, 7000190, 7000191, 7000164, 7000166, 7100146

Standards (Safety): IEC/EN 61010-1: 2001
CAN/CSA 22.2 No 61010-1: 2004
UL 61010-1:2004

IEC/EN 61010-2-010: 2003
CAN/CSA 22.2 No 61010-2-010: 2004
IEC/EN 61010-2-101: 2002
CAN/CSA 22.2 No 61010-2-101: 2004

Standards (EMC): EN 61326-1: 2006
EN 61000-3-2: 2006
EN 61000-3-3: 1995 +Corrigendum 1997 +A1: 2001 +A2: 2005
EN 61000-4-2: 1995 +A1: 1998 +A2: 2001
EN 61000-4-3: 2006
EN 61000-4-4: 2004
EN 61000-4-5: 2006
EN 61000-4-6: 1996 +A1: 2001
EN 61000-4-11: 2004

This product complies with the essential requirements of the Low Voltage Directive 2006/95/EC and
EMC directive 2004/108/EC, when used for its intended purpose.

Manufacturer address: INHECO Industrial Heating and Cooling GmbH
Fraunhoferstr. 11
82152 Martinsried
Germany

Phone, fax: Tel.: +49 (0) 89 899 593 -100
Fax: +49 (0) 89 899 593 -499

Martinsried, May 11th, 2010



Place and date of Issue Günter Tenzler, Managing Director

9 Warranty

2 Years from date of shipment. Any damage by abuse or caused by operation different form this instruction is not covered.

INHECO will accept only devices for repair that are not exposed to human or animal blood or fluids, chemical or biological fluids or radioactive or radiation materials except the device has be decontaminated according the corresponding decontamination method. Devices exposed to biosafety level 3 and 4 environments will not be accepted by INHECO for return.

10 Transportation and Storage

The Thermosahke may only be transported and stored in its original package to ensure maximum protection. It is recommended keeping the original package. The transportation and storage conditions can be found in table 1 at Technical Data.

Annex A: Glossary

Offset

The difference between the set point and actual values once the system stabilizes.

Calibration

Adjusting an instrument to a known value.

PID

(Proportional, Integral, Derivative). A control mode: proportional action sets the system, integral reduces droop, derivative reduces overshoot and undershoot.

PT100

PT100 is a Resistive-Temperature-Detector (RTD). This sensor increases his resistance with increasing temperature.

Signal

Any electrical transmittance that conveys information

Set point

The desired process value programmed into a control

Annex B: Index of Acronyms

Table 3: Index of acronyms

Adc	Direct current
MTC	Multi TEC Control
STC	Single TEC Control
PID	Proportional-, Integral- und Derivative Function of TEC Control
TEC	Thermo-Electric-Cooler
Vac	AC Voltage
W	Watt

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Annex H: Document history

Version	Date	Name	Comment
1.0	October 2011	GMA	First release
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